3.6

Mathematics of Finance

Interest Compounded Annually:

If a principal P is invested at a fixed annual interest rate r, calculated at the end of each year, then the value of the investment after n years is:

 (r is a decimal)

Ex. Suppose Jessie finds a $51 bill on the ground at Utah State. She decides to put it in the bank until she graduates. Many obstacles prevent her from graduating for several years. Twenty-five years later at her graduation she finds a $3 bill and remembers the $51 she put in the bank. How much money does Jessie now have if the rate was 11.5%?

+$3 that she found = $778.25!

Compounding k-times per year

 k is the number of times per year interest is compounded

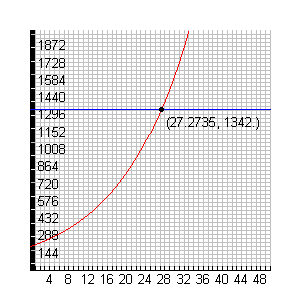
EX. Jessie has now become a little wiser now that she has finally graduated from college. She decides to put her $778.25 in another account with an interest rate of 13.2% that compounds monthly. How much money will she have after she receives her masters degree 10 years later?



Finding the time period of an investment

EX. Jackie has $200 to invest at 7% annual interest compounded monthly. How long will it take for her investment to grow to $1,342?





We can solve graphically: Graph  and 

The intersection is at the point (27.27, 1342), therefore it

will take 27 years 3 months to have $1342 in the bank.

We can solve algebraically,

       =



Interest Compounded Continuously

 r- interest rate t- time

Ex. Jessie and Jackie’s brother Cole is a bit wiser with money. He has earned $1500 over the summer mowing lawns. He finds a bank that compounds interest continuously at a rate of 11.5%. He decides to put his money in the bank until he graduates from high school so, he will have some money for college. After 3 years he graduates and is ready to start college. How much money does he have in the bank?



Cole receives a football scholarship (at the U of U) and decides to keep the money in the bank until he graduates from college. After four years he graduates, how much money does he have in the bank now?



Future Value of an Annuity

The future value FV of an annuity consisting of n equal periodic payments of R dollars at an interest rate *I* per compounding period (payment intervals) is:



Ex. At the end of each quarter year Clay makes a payment of $100 into his college fund. It earns 8.11% annual interest compounded quarterly. What will be the value of his investment in 5 years when he is ready to start college?



Present Value of an Annuity

The present value of an annuity consisting of n equal payments of R dollars earning an interest rate *i* per period is:



EX. After their kids finally graduate from college the Lambournes can finally buy a new vehicle. They purchase an SUV for $33,333. What are the monthly payments for a 5 year loan with a $3,000 down payment and an APR of 3.3%?



R = $549.10

